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Dr. R. S. Lull, Yale University, New Haven, Conn.

Dr. J. H. McGregor, Columbia University, New York City, N. Y.

Dr. W. D. Matthew, American Museum of Natural History, New York City, N. Y.

Professor H. F. Osborn, American Museum of Natural History, New York City, N. Y.

Professor W. B. Scott, Princeton University, Princeton, N. J.

Dr. W. J. Sinclair, Princeton University, Princeton, N. J.

The following papers were presented at the meeting:

TITLES OF PAPERS READ AT THE MEETING

Dr. J. H. MCGREGOR: 'Mesosaurus and Stereosternum from the Permian of Brazil.' Illustrated by drawings, photographs and specimens.

Professor H. F. OSBORN: 'Faunal Succession in the American Tertiaries.' Charts and lantern.

Professor H. F. OSBORN: 'Brief Notices of Tyrannosaurus, Naosaurus, Elephas columbi, Allosaurus, and other Vertebrates Recently Mounted at the American Museum of Natural History.'

Dr. W. D. MATTHEW: 'A Lower Miocene Fauna from South Dakota.'

Professor F. B. LOOMIS: 'Conditions under which the Wasatch and Wind River Beds were Deposited.'

Dr. L. HUSSAKOF: 'The Devonian Fish-bearing Formations of Ohio and Eastern Canada.' Lantern illustrations.

Dr. BASHFORD DEAN: 'Notes on Fossil Sharks.' Illustrated by models.

Dr. W. K. GREGORY: 'Brief Notes and Observations on the Theory of Trituberculy.'

Dr. W. K. GREGORY: 'Exhibition of a Specimen of *Prorosmarus alleni*, a Primitive Walrus from the Miocene.'

Professor W. B. SCOTT: 'The *Litopterna*.' (The President's address).

Dr. CHAS. S. MEAD: 'The Gait and Correct Pose of *Brontosaurus*.' Illustrated by model of skeleton.

Mr. A. O. PETERSON: 'A Section of the Lower Miocene of Nebraska, and a List of its Vertebrate Fauna.'

Mr. EARL DOUGLAS: 'A Restoration of *Palæomeryx*.'

The following officers were elected for the ensuing year:

President—Professor Bashford Dean, Columbia University, New York City, N. Y.

Secretary-Treasurer—Professor Frederick B. Loomis, Amherst College, Amherst, Mass.

Executive Committee—Professor E. H. Barbour, University of Nebraska, Lincoln, Nebraska; Mr. Lawrence M. Lambe, Geological Survey of Canada, Ottawa, Canada; Professor J. C. Merriam, University of California, Berkeley, California; Dr. W. J. Sinclair, Princeton University, Princeton, N. J.

MARCUS S. FARR,
Secretary-Treasurer

PRINCETON, N. J.,
December 31, 1906

SCIENTIFIC BOOKS

THE BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY.

IN the issue of May 25, 1900, of this journal a review was given of the *Bulletin of the American Museum of Natural History*. It was intended to be of some assistance to those unacquainted with the extent of these scientific contributions. It was suggestive simply, and embraced no intention of giving details or exhaustive titles. It concluded with volume XII. Since then nine volumes have been published, and a new series of subjects

BULLETIN SERIES: ANALYSIS OF CONTENTS. (PAPERS PUBLISHED.)

	13.	14.	15.	16.	17.	18.	19.	20.	21.
			Part 1.		Parts 1, 2, 3, 4.	Parts 1, 2, 3.			
Ethnology	1	1	1	1	3	3		2	2
Archæology	3	1							
Mammalogy	9	9		14			8	11	
Ornithology	2	2		1				2	4
Ichthyology									
Herpetology									
Entomology		2		3			6	9	9
Invert. Zoology ..		3		1			1		
Conchology		1							
Paleontology (Vert.)	4	3		8			12	11	7
Paleontology (Invert.) ...	2	1		4			3	3	3
Geology		1		2			1		
Mineralogy	1								
Catalogue								1	
Pages ..	330	422	370	514	380	278	713	539	426
Plates	19	46	4	59	58	56	59	14	17
Figures and Cuts ..	74	63	172	126	67	102	137	130	82

have appeared on its pages. A very eclectic notice is again offered, in which particularization will be even more limited than was the case in 1900. A tabulation of general classes of subjects, number of papers published under each, and the number of pages, figures and cuts, in each volume, is here subjoined. It can be expected that, in the wide circulation of SCIENCE, many readers will welcome this generalized description of the *Bulletins of the American Museum*.

A comparison between this table and the table of analysis of contents of this publication, for the first twelve volumes, shows an increase in the papers on entomology and vertebrate paleontology, continued activity in mammalogy, a decrease in ornithology, and generally elsewhere, conditions similar to those preexisting.

The bulletins show a tendency to increase in size, and the appearance of new workers as Drs. Matthew, Gidley and Hay and Professor Wheeler, with others (Nelson, Duerden, Loomis, Hussakof, Brown Van Duzee, Banks, Miller, Brues, Bandelier) diversify the pages with new authors, and animate them with new treatments. Papers of very considerable length are noticeable, as Part I. of Vol. XV., in Professor Boas's 'The Eskimo of Baffin Land and Hudson Bay,' the extended essays by Kroeber on topics furnished by the Arapaho Indians, studies supported by Mrs. Morris K. Jesup; and Dixon's contributions to the ethnology of California in the Huntington Expedition.

The first article in Vol. XIII., by Dr. Allen, discussed the mountain caribou of British Columbia with especial reference to Mr. Ernest Seton-Thompson's new species (*R. montanus*) and forms another contribution to the often noted variability of the genus, and contained the statement 'doubtless when series of specimens of caribou from different parts of Alaska, including the tundra district west of the Mackenzie Delta, and from different parts of the Northwest Territory, are brought together, it will be found that the caribous of the region north of the United States are differentiated into quite a number of well-marked local forms, as yet unde-

scribed.' Professor Whitfield describes some interesting fossils (*Receptaculites*, *Halysites*, *Heliolites*) from the arctic, brought back by Lieut. Peary. Mr. Stone contributes a narration, in part, of his adventuresome journey along the coast of northern Alaska. A shell gorget of Tarascan origin and certainly important, and an onyx jar from Mexico are described by M. H. Saville, and the same investigator adds an important and readable article on 'Cruciform Structures near Mitla.' Professor Osborn furnishes a discussion of the Phylogeny of the Rhinoceroses of Europe which illustrates "*the early separation, absolute distinctness, and great age of numerous phyla leading up to modern types.*" In importance this article easily exceeds the associated papers of this volume. The volume contains also a very illuminative analysis of variation in the meadow-lark by F. M. Chapman.

In volume XIV. two new contributors appear, W. D. Matthew and J. W. Gidley, both of whose names have since become very strongly impressed upon American vertebrate paleontology. Matthew's 'Additional Observations on the Creodonta,' and J. W. Gidley's 'Tooth Characters and Revision of the Genus *Equus*,' in point of originality and permanent results are the most valuable papers in the volume. Dr. Allen prepared a review of the question of the relationship of the musk-oxen of Arctic America and Greenland which also contained an extended historical reference. The same distinguished systematist included in this volume a study on the North American opossums. Dinosaur Contribution No. 6, by Osborn and Granger, appears in this volume, and Beutenmüller continued his painstaking papers on the lepidoptera. A useful descriptive catalogue of the Binney and Bland collection of mollusks closed the volume with six maps of *distributional intensity*, which were something of a novelty.

About this time an attempt was made to segregate articles on one class of subjects in single volumes, and volumes XV., XVII., XVIII. were in this way devoted to ethnology. These volumes are not yet completed and contain laborious papers by Boas, Dixon,

Kroeber and Wissler, papers for the most part concerning the aspects, features and results of the Mrs. Morris K. Jesup and Huntington Expeditions.

In volume XVI. perhaps preeminence of interest attaches to Aleš Hrdlička's paper on 'The Crania of Trenton, New Jersey, and their Bearing upon the Antiquity of Man in that Region,' which concluded with these pregnant words: "It may be added that all the crania described in this paper differ widely from those of the Eskimo (nor can I recollect a single important somatological fact, from my investigations or those of others, which would support the theory of a prehistoric occupation of *any* of the eastern states below the St. Lawrence river by the Eskimo)." New species, as usual, are described in this volume, both of fossil and living animals. An almost entertaining article by Professor Whitfield accomplishes the desirable result of proving that three fossil genera of cephalopoda are different stages of one, a fact distinguishable in the beautiful examples of *Heteroceras* in his cabinet of Cretaceous fossils. The important papers on phylogeny, by Professor Osborn, were continued, and an admirably illustrated paper by Dr. E. O. Hovey on the eruptions in Martinique and St. Vincent seems a welcome variation from the endless process of creating and destroying species. Professor Whitfield's description of a genus of fossil alga in the Niagara shale has interest, as well as that of the new teredo-like shell from the Laramie. Mr. Beutenmüller added one of his instructive studies on larvæ of *Catocala*, and his minute discriminations in the 'Earlier Stages of some Moths.' Dr. Duerden's paper on 'Algæ as agents in the Disintegration of Corals' is in this volume.

Volume XIX. is the thickest, the most voluminous of all the volumes, though it does not contain more articles nor does it exceed in interest its precursors. The new contributors were making themselves felt and the topics were, in some instances, to a degree, synoptical and comprehensive. Dr. Hay opens the nineteenth volume with a technical and strong paper on 'North American Cretaceous

Fishes,' in which the author displays his surprising anatomical skill. It involved very large corrections of previous observers. 'The Mammals of Northeast Siberia,' by Dr. Allen, was important. It emphasized the fact of the intimate relationship of the mammalian fauna of Siberia with that of Alaska. The itinerary of Mr. U. G. Buxton accompanying this paper is extremely interesting, and his notes appended to Dr. Allen's descriptions make good reading, and are most instructive. Dr. Allen concludes:

There is thus evidence that eastern Siberia has derived some of its present mammalian life from boreal America, and doubtless within a comparatively recent period. The American origin of various early types that eventually attained circumpolar distribution, as the horse, camel, rhinoceros, phyla, etc., is now well established by paleontological evidence, but that the same is true of some forms of the existing mammalian fauna does not appear to have been heretofore recognized.

Dr. Matthew discusses the minute fauna of the Titanotherium beds of Montana. A paper by Dr. Hrdlička on the parietal bone in Men and Mammals was somewhat responsible for the bulkiness of volume XIX. It was a rather over-extended discussion, but very learned, of an osteological feature, which apparently refuses to yield to this persistent study very definite conclusions.

Professor W. K. Gregory contributed a suggestive paper on the 'Shortening of the Elephant's Skull,' concluding:

The skull as a whole is thus highly adapted to resist the severe strains put upon it. The occiput, both in ontogeny and phylogeny, flattens out and rotates backward, spreading both vertically and laterally, until at last it forms, as it were, a great functionally solid bed-plate, receiving the thrusts of the opposite inverted arches into which the skull has been resolved.

Dr. Hay added another extended paper, on 'Cretaceous Fishes from Mt. Lebanon,' in which there were new species and new facts. Professor Osborn describes a new dinosaur, Mr. Gidley a new three-toed horse, and remarks that 'it seems probable that the genus *Hipparion* is limited in distribution entirely to the old world, and that the American

species formerly referred to this genus should be placed in a group distinct from *Hipparion*.'

A valuable paper of Professor Whitfield's on 'Six New Species of Unios from the Laramie Group,' attracts attention in this volume, pointing as it does to a possible western metropolis and origination for fresh-water shells of this family in the central and Mississippi basins.

A new glyptodon from the lower Pleistocene of Texas was described by Professor Osborn, and possesses extreme interest. "It proves to represent a new genus and species, combining characters of several of the South American forms of the Pleistocene and Miocene periods."

The Stone Expedition to Alaska in 1902 collected 1,100 specimens of mammals, representing 43 species and subspecies, in which are 50 head of large game, and a series of 31 skulls of the Kadiak bear. It was a remarkable collection. Dr. Allen describes it, and among its additions to existing species is to be noted the Osborn caribou (*R. osborni* Allen). Mr. Barnum Brown describes a new genus of ground sloth from the Pleistocene of Nebraska, Mr. Beutenmüller new insects, and Professor Wheeler distinctly furnishes a new literary and scientific interest in his careful studies and speculations upon ants, amongst which prominence should be given to his views upon *gynandromorphism* in these insects.

Vol. XX. of the *Bulletin* was characterized by the signal predominance of the papers in 'Mammalogy, Vertebrate Paleontology and Entomology.' It is impossible or unnecessary to particularize. The articles were systematic and descriptive; all possess the distinctive authority of their writers in their several fields of research, but two, of especial interest, claim individual notice. The first is by Dr. Matthew, on 'Two New Oligocene Camels,' from which this conclusion may be quoted:

In the Miocene the camels show increasing divergence and variety of type, and their relationship to the preceding and succeeding stages is far from clear. While we have reason to believe that the center of dispersion of the Camelidæ was somewhere on the North American continent, we have no reason to believe that it was in the partic-

ular regions from which our fossil species have been obtained.

The second is by Professor Osborn on the great Cretaceous fish, *Portheus molassus* Cape. It is preliminary and brief, but it announced the possession by the museum of a most remarkable and monstrous fossil fish procured by Mr. Charles H. Sternberg in 1900 from near Elkada, Logan Co., Kansas. Professor Wheeler included in this volume a very readable and attractive paper on 'Social Parasitism among Ants.'

In volume XXI. two very important papers from Dr. Hay are noticed in which that well-known osteologist locks horns with European authors, and discusses the origin and relationships of the testudines. A paper admirable in diction and beautifully illustrated is Chapman's 'Life History of the American Flamingo.' Professor Wheeler contributes a discussion on 'An Interpretation of the Slave-making Instincts in Ants,' which is somewhat varied in type from the ordinal group of papers, and is very suggestive. The remainder of the volume contains the valuable and learned studies of the naturalists, whose papers have now for over twenty-six years maintained the high standard of this publication.

L. P. GRATACAP.

AMERICAN MUSEUM OF NATURAL HISTORY.

The Relation of Leaf Structure to Physical Factors. By EDITH S. CLEMENTS. *Transactions of the American Microscopical Society*, 1905, pp. 19 to 102. Published under a grant from the Spencer-Tolles fund.

In studying the reaction of the plant to its physical environment the leaf is a peculiarly favorable subject, because of its ready response to alterations in the environmental factors and because of the clearness with which such response is manifested in changes of structure. A considerable literature on the relations of leaf structure to environment has grown up in Europe, based upon the vegetation of northern Africa, tropical Asia, etc., as well as of Europe. But the subject has received comparatively little attention from North American botanists, notwithstanding the fact that our wide range of climate and conse-

quent diversity of vegetation-types offer exceptional opportunities for this line of research.

Mrs. Clements's paper, which constitutes another of the valuable contributions to ecological botany that have issued from the School of Botany of the University of Nebraska, should, therefore, receive a cordial welcome, the more so as it embodies the results of a well-considered and carefully executed plan of investigation. One is impressed at first glance with the great amount of painstaking work that has been necessary to carry out this plan. Not only have the details of leaf anatomy been studied in about 300 species of plants, most of which were represented by at least two different habitat-forms, but a large number of measurements were necessary to obtain the normals of the more important physical factors for each of a score of habitats. The methods followed are those outlined in Dr. F. E. Clements's 'Research Methods in Ecology.' The investigations were carried on during the summers of 1903 and 1904 in the mountains and foothills around Pikes Peak, Colo., with headquarters at the alpine laboratory of the University of Nebraska at Minnehaha. The paper begins with a survey of the most important literature. In a table on page 29 are presented the normals of light, atmospheric humidity, temperature (of the air, the surface of the ground and the soil) and water content of the soil for each of the habitats studied. The greater part of the paper is devoted to brief descriptions of the leaf anatomy of the species examined, both as to the normal structure and as to the variations caused by change of habitat. Quantitative variations were given much attention and were carefully measured. 'Endemic' species (those occupying only one habitat) are grouped according to habitat under the three types of hydrophytic, mesophytic and xerophytic plants. 'Polydemic' species (those occurring in more than one habitat) are also grouped as hydrophytes, mesophytes and xerophytes, according to the normal habitat of the species, but their classification according to habitat is not carried further. Instead, under each species name is

given a synopsis of the chief physical factors of the normal habitat, with brief descriptions of the corresponding leaf structure, followed by indications of the points of difference in the physical factors and leaf structure in the other habitats of the species.

A series of tables of species follow in which are graphically expressed the variations from the normal leaf structure that accompany departures from the normal environment, the varying factors of the latter being stated at the head of the table thus: 'light unchanged, water and humidity decreased.'

In the summary are stated the most important of the author's conclusions as to the effect upon the anatomical structure of leaves of each of the physical factors studied, attention being called to the points of agreement or of disaccord with the results of Heinricher, Dufour, Stahl and other well-known investigators. In future researches the writer believes that the phases of the subject which should receive especial attention are: "(1) the hereditary structure, which should include considerations of size, shape and position of leaf, as well as histology and modifications, such as hairs, stomata, mucilage cells and the like; (2) exact records of the physical factors of the habitat of the species for the day and for the growing season; (3) the physiological processes of the leaf; (4) the interrelation and correlation of the preceding data."

The paper is illustrated by nine excellent plates, showing the habitat variations of many of the species described.

To say that Mrs. Clements has published one of the most important papers dealing with this phase of American ecological botany is to render no more than justice to her achievement. An especially commendable feature of her work is the great volume of careful observations that serve as a basis for what generalizations are made. So high a ratio of fact to theory does not always characterize this branch of botanical literature. A good service has been rendered to American students of plant ecology by pointing out a field for future research which can not fail to be fruitful of results.

THOMAS H. KEARNEY

Beet-Sugar Manufacture. By H. CLAASSEN, Ph.D. Authorized translation from the second German edition by WILLIAM T. HALL, S.B., and GEORGE WILLIAM ROLFE, A.M. New York, John Wiley and Sons. 1906. Pp. xiv + 280.

Claassen's 'Die Zuckerfabrikation' was first published in 1901. Its sterling merits soon won for it such general recognition that the second edition in German followed within a few years, and now we have an authorized English translation of the work.

The scope and plan of the book embraces the entire process of beet-sugar manufacture from the time of the receiving of the beets to the finished product.

Individual chapters are devoted to the delivery of beets, their transportation and washing, weighing and slicing, utilization and disposal of exhausted chips, the process of defecation and of carbonatation, evaporation, the boiling of sugar, the preparation of raw sugar and the preparation of sugar crystals, the treatment of after-products and the utilization of molasses.

In addition to these themes the book discusses the boiler-house, the questions of economy of fuel, high-pressure and low-pressure boilers, heat losses, the construction and operation of lime-kilns, the factory control and determination of sugar losses, the setting up and running of a beet-sugar factory and the utilization of waste products incidentally produced in the process.

This mere enumeration of the contents of the work well indicates that the author has intended to prepare a monograph of beet-sugar manufacture which should not lack a single essential detail—and Claassen has succeeded in doing all which he has set out to do.

His thorough practical knowledge of beet-sugar manufacture—for many years he has been the director of one of the leading beet-sugar houses of Germany—joined to an exceptional ability to express his thoughts in a clear and concise manner, has resulted in the production of a book which ranks with the very best in the sugar literature of the day.

Turning from the work of the author to that of the translators, it is a pleasure to state

that their work, too, is everything that could be desired.

In their preface they state that they have introduced into the English text data of factory practise in units which are employed in American houses. In many beet-sugar houses in this country the metric system is well understood and the centigrade thermometer is used; it is to be hoped that the introduction by the translators of the American equivalent weights and measures will tend to a greater familiarity with, and ultimately to the sole use of, the metric system in this important and growing industry.

Several of the tables appearing in the German edition have been omitted in the English text; also Appendix II., which treats of the construction of an evaporating-plant and the steam consumption for working 100 kg. beets per minute, and Appendix III., which deals with sugar statistics. These omissions seem well warranted, as the matter thus left out is presumably of very little importance to the general reader.

A few typographical errors and slips have crept in, but these will unquestionably be noted and corrected in a future edition, which, no doubt, will soon be warranted.

The American sugar industry is certainly to be congratulated on having so valuable and practical a book placed at its disposal.

F. G. WIECHMANN

SCIENTIFIC JOURNALS AND ARTICLES

THE *American Naturalist* for December contains the second, and concluding instalment of 'The Causes of Extinction of Mammalia,' by Henry F. Osborn. This discusses such matters as infectious diseases and insects, competing and hostile mammalia, internal causes of extinction, and the inadaptation of extreme size or specialization, with many references to literature on the subject and citation of examples. And yet, in summing up, Professor Osborn says: "The chief induction which can be made from this extensive survey of the causes of extinction seems to be this: following the diminution in number which may arise from a chief or original cause, various other causes conspire or are